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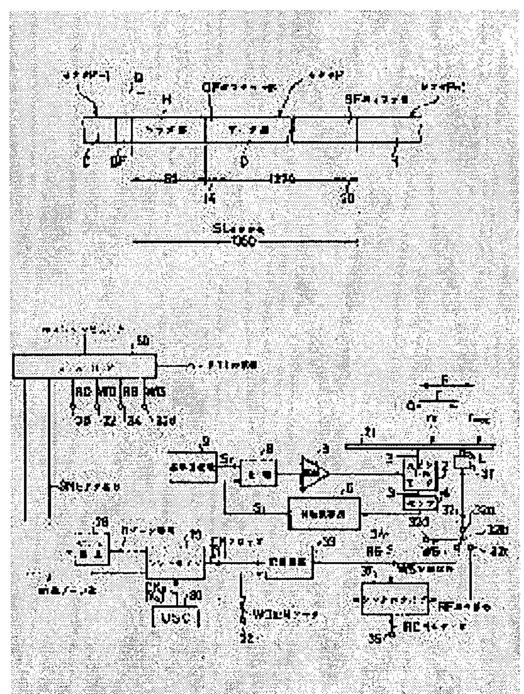
(54) DISK RECORDING/REPRODUCING SYSTEM



(57)Abstract:

PURPOSE: To use a disk formated with a CLV system by rotating with a CAV system by using recording/reproducing clocks different from each other whose frequencies become higher in staircase from inside to outside in the radial direction at every zone.

CONSTITUTION: The disk 21 formated by the CLV system is divided according to positions on a radius, and recording/reproducing is performed for respective divided areas. That is, the disk 21 is rotated by the CAV system, and the recording/reproducing clocks whose frequencies rise in staircase from inside to outside in the radial direction at every area are generated 29. Then, a length of a data part becomes longer in an outer peripheral side compared with an inner peripheral side in each area, and a buffer part BF by the much prolonging is provided, and the disk is used by rotating the disk formated by the CLV system by the CAV system. Thus, the large capacity by the CLV system is compatible with a high speed access property by the CAV system.

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CLAIMS

[Claim(s)]
[Claim 1] In the disk play back system which performs record playback to the disk formatted by CLV A means to classify the above-mentioned disk into a virtual zone according to a radius location, and a means to rotate the above-mentioned disk by CAV, It faces carrying out record playback to each virtual zone where the disk which rotates by the above-mentioned CAV was classified. The disk play back system used having a clock generation means to generate a different record playback clock with which a frequency becomes high stair-like for every virtual zone toward an outside from the radial inside, and making rotate the disk formatted by CLV by CAV.
[Claim 2] The disk play back system according to claim 1 secures a buffer zone to the part of the end in the unit field of the record part on 1 truck of the above-mentioned disk, and it was made to absorb the deflection of the record section length in the above-mentioned virtual zone by this buffer zone.
[Claim 3] As opposed to a predetermined virtual zone during record playback The above-mentioned predetermined virtual zone is received without carrying out adjustable [of the frequency of the above-mentioned record playback clock], when a record playback field shifts to the virtual zone contiguous to this predetermined virtual zone. The disk play back system according to claim 1 or 2 which was made to carry out record playback with the record playback clock of the set-up frequency continuously to the virtual zone contiguous to the above-mentioned predetermined virtual zone.
[Claim 4] A disk play back system [made / when a record playback field shifts to the virtual zone which adjoins during record playback to a predetermined virtual zone in this predetermined virtual zone, and prepare the record playback clock which has the frequency to this adjoining virtual zone which synchronized beforehand and shifting to the above-mentioned virtual zone carry out contiguity / it / switch to the record playback clock made / above-mentioned / preparations] according to claim 1 or 2.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention is applied to for example, the added type light disk drive of a postscript, and relates to a suitable disk play back system. in addition, the vocabulary of "record playback" shall mean record and (or) playback among this specification or an accompanying drawing
[0002]
[Description of the Prior Art] As a disk play back system, corresponding to the rate (rotation of disk) controlling method of arrangement of the sector on a disk, and a spindle motor, the all directions type of CAV (Constant Angular Velocity : constant angular velocity), CLV (Constant Linear Velocity: constant linear velocity), and MCAV (Modified CAV: zone constant angular velocity) is known well, and practical use is presented with it from the former.
[0003] Drawing 5 is the block diagram which generalized the roll control system of a disk. In addition, although illustration has not been carried out, the record reproducing head is moved to radial [of a disk 1 / R]. In drawing 5 , a disk 1 is rotated through the end of a shaft 3 by the spindle motor 2.
[0004] The rotation sensor 4 which detects the rotational frequency of a frequency electric organ etc. is attached in the other end of a shaft 3. It is the rotational frequency signal S1 in the output of the rotation sensor 4 to the rotational frequency detector 5. It is formed. Rotational frequency signal S1 The comparison input terminal of a comparator circuit 6 is supplied. A terminal 7 is led to the reference input terminal of a comparator circuit 6, and it is the reference signal S2 of a predetermined rotational frequency. It is supplied.
[0005] Therefore, it is the rotational frequency signal S1 by the comparator circuit 6. The rotational frequency value and reference signal S2 to express It is the drive circuit 8 to the driving signal S3 so that the criteria rotational frequency value to express may be compared and the error may become a zero value. The so-called servo loop consists of that a spindle motor 2 is supplied, and a disk 1 is a reference signal S2. It will rotate with the criteria rotational frequency value to express. In addition, in order to raise the precision of a servo, a phase control loop formation and a speed-control loop formation are constituted according to an individual, or a phase compensating network is added, but by drawing 5 , since it has simplified, this servo loop is not illustrated.
[0006] Hereafter, the three above-mentioned methods are explained, referring to this drawing 5 suitably. The 1st CAV is a method which performs record playback to a disk 1, always holding rotation of a disk 1 to the number of fixed rotations. Therefore, reference signal S2 A value is set as constant value to a radius. Drawing 6 A shows the format of the disk 1 recorded by CAV. The hatching field shown with signs 10 and 11 shows the record section of the unit sector of each truck by the side of an inside-and-outside periphery among drawing, respectively. As shown in this drawing, in disk formatting of CAV, the die length of the hoop direction on the actual namely, physical disk 1 required to record a unit sector gradually toward a periphery side from the inner circumference side of a disk 1 is long. After all, in this CAV, since recording density falls gradually toward a periphery side from the inner circumference side of a disk 1, it can be said that the storage capacity as the whole is small in comparison.

[0007] The 2nd CLV is a method which performs record playback to a disk 1, changing rotation of a disk 1 to the rotational speed in inverse proportion to the radius of a disk 1 (a reference signal S2 is set up such.). Drawing 6 B shows the format of the disk recorded by CLV. The hatching field shown with signs 12 and 13 shows the record section of the unit sector of each truck by the side of an inside-and-outside periphery, respectively. The die length of the hoop direction of record sections 12 and 13 is the same. Therefore, since the same recording density is obtained all over a disk 1, storage capacity becomes max theoretically. Storage capacity is usually about 1.5 times as compared with CAV.
[0008] However, in this CLV, in order to hold linear velocity uniformly, it is necessary to change the rotational frequency of a spindle motor 2 corresponding to the location of the disk 1 of the record reproducing head radial [R]. That is, reference signal S2 It is necessary to define a value (criteria engine-speed value) as a function of a record regenerative-track number (track number). changing the rotational frequency of a disk 1 with access to the sector of the arbitration of the record reproducing head radial [R] in this CLV -- indispensable -- especially -- for example, it is comparatively alike, and is comparatively alike from an inner circumference side, and there is a fault that the access time at the time of migration of the record reproducing head of the long-distance section by the side of a periphery becomes long fairly.
[0009] In addition, since the number of sectors in which both the methods of CAV and CLV carry out record playback per unit time amount is fixed, a data transfer rate turns into the same rate all over a disk 1. If it says and replaces, the frequency of a record playback clock will be frequency same all over a disk 1.
[0010] While a MCAV method employs the advantage of CAV in the 3rd efficiently, it is a method aiming at the increment in storage capacity. Reference signal S2 The value is fixed to a radius. Drawing 6 C shows the format of the disk 1 recorded by this MCAV method. By this method, the record playback side of a disk 1 is classified into two or more physical zones 16a, 16b, and 16c and --, and CAV performs record playback in each zone. If a zone changes, the frequency of a record playback clock will be changed, an usable maximum clock frequency will newly be set up in the zone, and record playback will be performed. Consequently, if the record sections 17a, 17b, and 17c in the most inner track of each zone and the die length of --, i.e., unit sector length, are fixed and put in another way, recording density becomes the same, and the number of sectors per truck will increase as it goes to a periphery. By this MCAV method, since the frequency of a record playback clock changes for every zone, a data transfer rate changes with zones.
[0011] Drawing 7 measures and shows the disk storage capacity about three above-mentioned methods. drawing 7 -- setting -- an axis of abscissa -- radius r0 of the most inner circumference of the record section of a disk 1 Radius rmax of a truck to the outermost periphery up to -- the truck is shown and the axis of ordinate shows the number of sectors per truck corresponding to the predetermined radius r. Radius r0 It is the number of sectors of a truck S0 It expresses and is a radius rmax. The number of sectors of a truck is expressed with Smax. Therefore, area is equivalent to the storage capacity of a disk 1. The trapezoid shown as the continuous line as which the stair-like graphic form shown with the alternate long and short dash line with which the rectangle shown by the dotted line which performed hatching contains CAV and its rectangle part contains a MCAV method and a rectangle part shows the storage capacity by CLV. Thus, the storage capacity of CLV turns into the maximum storage capacity theoretically (the example of drawing 7 about 1.5 times of CAV).
[0012]
[Problem(s) to be Solved by the Invention] As described above, the access time of CAV is short, but since track recording density becomes low as a record section moves to the periphery side of a disk 1, there is a problem that the storage capacity as the whole is small.
[0013] moreover -- since linear velocity of CLV is fixed and it is recorded -- storage capacity -- being large (about 1.5 times of CAV) -- since it is necessary to change the rotational frequency of a spindle motor 2 according to a radius, there is a problem that the access time is long.
[0014] Furthermore, by the MCAV method, since it is a fixed engine speed, storage capacity with it is obtained, but since the disk is divided into the zone of physical immobilization, if change control of a

record playback clock is not performed always managing the absolute address correctly, there is complexity that there is nothing. [near / the access time is short and / CLV] Moreover, since a data transfer rate is different 2 times by the inside-and-outside periphery, there is a problem that control becomes complicated, similarly.
[0015] Then, in consideration of these technical problems, the invention-in-this-application person considered the technique indicated by the specification concerning Japanese-Patent-Application-No. No. 317223 [four to] application. This invention is invention which improved this technique, and in order to clarify the technical problem of this invention in advance, it explains this advanced technology briefly below.
[0016] Drawing 8 is a diagram for explaining this technique. With this technique, the optical disk 21 of the core O formatted by CLV is classified into m virtual zones V (V= 1, 2 and 3, ..., m) according to a radius location. While facing each classified virtual zone V carrying out record playback and generating a different record playback clock with which a frequency becomes high stair-like toward an outside at each virtual zone V of every from the inside radial [R] Since it was made to decrease the engine speed of a disk 21 according to the increment in a radius r in each virtual zone V, record playback of track-recording-density regularity can be performed by selecting appropriately the rate of the increment in a record playback clock frequency, and the rate of reduction of the engine speed of a disk.
[0017] That is, according to this technique, theoretical maximum is obtained similarly to CLV by storage capacity, and, on the other hand, the access time has the effectiveness that the access time near CAV is obtained.
[0018] Thus, according to this technique, fluctuation of the rotational frequency of a disk is suppressed few by switching the frequency of a record playback clock stair-like.
[0019] However, though fluctuation of the engine speed of a disk can be suppressed few, the engine speed of a disk must be made adjustable and the configuration of the roll control system for it becomes complicated.
[0020] This invention is made in consideration of such a technical problem, and it aims at offering the disk play back system which makes it possible to perform the roll control of the disk of CLV by perfect CAV.
[0021]
[Means for Solving the Problem] In the disk play back system which performs record playback to the disk 21 with which this 1st invention was formatted by CLV A means 50 to classify a disk 21 into the virtual zone V according to a radius location, It faces carrying out record playback to each virtual zone V where a means 2 to rotate a disk 21 by CAV, and the disk 21 which rotates by CAV were classified. It is made to use it, having a clock generation means 29 to generate a different record playback clock CK with which a frequency f becomes high stair-like for every zone toward an outside from the radial R inside, and rotating the disk 21 formatted by CLV by CAV.
[0022] This 2nd invention secures a buffer zone BF to the part of the end in the unit field P of the record part on 1 truck of a disk 21, and it is made to absorb the deflection (expansion and contraction of the record section length D) of the record section length D in the virtual zone V by this buffer zone BF in this 1st invention.
[0023] This 3rd invention receives predetermined virtual zone V=i in these 1st and 2nd invention. During record playback the virtual zone contiguous to this predetermined virtual zone -- for example As opposed to virtual zone V=i predetermined [without carrying out adjustable / of the frequency fi of the record playback clock CK /, when a record playback field shifts to V=i +1] It is made to carry out record playback continuously to virtual zone V=i +1 which adjoins predetermined virtual zone V=i with the record playback clock CK of the set-up frequency fi.
[0024] In these 1st and 2nd invention, as shown in drawing 4 , this 4th invention It is the record playback clock CK 1 to a predetermined virtual zone. When a record playback field shifts to the virtual zone which adjoins during record playback in this predetermined virtual zone Record playback clock CK 2 which has the frequency to this adjoining virtual zone which synchronized beforehand Record playback clock CK 2 prepared when preparing and shifting to the above-mentioned virtual zone which

carries out contiguity It is made to switch.
[0025]
[Function] According to this 1st invention, the disk formatted by CLV is classified into a virtual zone according to a radius location. Face carrying out record playback to each classified zone V, rotate a disk by CAV, and from the radial inside for every zone by using a different record playback clock with which a frequency becomes high stair-like toward an outside It enables it to use the disk formatted by CLV, making it rotate by CAV (rotational frequency regularity).
[0026] [0027] which can use the disk certainly formatted by CLV, being able to rotate by CAV (rotational frequency regularity) since a buffer zone is secured to the part of the end in the unit field of the record part on the truck of a disk and he is trying to absorb the deflection of the record section length in a virtual zone by this buffer zone in this 1st invention according to this 2nd invention According to this 3rd invention, a predetermined virtual zone is received in these 1st and 2nd invention. During record playback The above-mentioned predetermined virtual zone is received without carrying out adjustable [of the frequency of the above-mentioned record playback clock], when a record playback field shifts to the virtual zone contiguous to this predetermined virtual zone. It is made to carry out record playback with the record playback clock of the set-up frequency continuously to the virtual zone contiguous to the above-mentioned predetermined virtual zone. When it does in this way, in case a zone is crossed, it is not necessary to switch a record playback clock.
[0028] According to this 4th invention, predetermined virtual zone V=i is received in these 1st and 2nd invention. During record playback When a record playback field shifts to the virtual zone (for example, V=i +1) contiguous to this predetermined virtual zone When preparing the record playback clock which has the frequency to this adjoining virtual zone which synchronized beforehand and shifting to the above-mentioned virtual zone which carries out contiguity, he is trying to switch to the record playback clock which made [above-mentioned] preparations. Record playback can be carried out to stability not only at crossing a zone once but at the time of the record playback which crosses twice continuously.
[0029]
[Example] Hereafter, one example of this invention disk play back system is explained with reference to a drawing. In addition, the same sign is attached to the thing corresponding to what was shown in above-mentioned drawing 5 - drawing 8 in the drawing referred to below. Moreover, also suitably with reference to the above-mentioned drawing, it explains if needed.
[0030] A format of the disk used in this example is a format of the CLV disk shown in drawing 6 B. Thus, the sign of the disk formatted by CLV is set to 21 (the disk of drawing 8 is also made into the sign 21.).
[0031] Drawing 1 shows the sector format of the disk 21 which is an optical disk of a postscript mold. This sector format is ISO/IEC. DIS It is the optical disk of the rewritable mold (it can be used also as a postscript mold) specified to 10089, and the arrow head Q shows the relative trace direction of the head in the case of record playback among drawing 1 .
[0032] The sector P enclosed with the thick wire which is the unit field of the record part on 1 truck consists of the buffer sections BF which follow the data-division (record section length) D pan following the offset section OF following header H preformatted (for example, PURIPITTO by embossing) and its header unit-H of the place following the buffer section (buffer zone) BF of the sector P-1 in front of one, and this offset section OF at this data-division D. Header H of the following sector P+1 follows the degree of the buffer section BF of Sector P.
[0033] 1 sector-length SL is 1360B (cutting tool) in the above-mentioned sector format, and, for the die length of header H, the die length of 52B and the offset section OF is [the die length of 1274B and the buffer section BF of the die length of 14B and data-division D] 20B. The buffer section BF is formed as a field for data-division D and the buffer section BF to absorb it, even if it is the same recordable (postscript) field in fact and changes the physical die length of the data-division D in the case of writing, such as a postscript to data-division D. A physical boundary is not necessarily between data-division D and the buffer section BF. In this example, the rate of the die length of the buffer section BF is simply called for from each cutting tool length's ratio, and is 1.57% to data-division D 1.47% to sector length

SL.
[0034] As everyone knows, the VFO (variable frequency oscillation) section for the sector mark showing the head of the sector P and PLL (phase locked loop) and the ID section on which the track number and the sector number are recorded are formed in header H. The VFO section added and the data field section in which a user can perform a postscript, or elimination and rewriting (in the case of rewritable mold disks, such as a magneto-optic disk) for data following the sink section exist in data-division D. The synchronization with header H only for leads (read-out) and switchable data-division D of read/write changes, and the offset section OF is the section. Therefore, a clock is switched in order of Read Read or read/write (writing/postscript) by header H and data-division D.
[0035] Drawing 2 A shows the partition of the virtual zone {the zone (also see drawing 8) which is not necessarily actually classified physically and was logically classified in the shape of a ring} of the optical disk 21 formatted in this way (preformat). on the occasion of record playback, a record section is first classified temporarily (virtually) to the most-inner-circumference radius r0 of a record section in accordance with radial [R] in m zones V (V= 1, 2 and 3, --i, i+1, ..., m-1, m) from -- outermost periphery radius rmax (Zone V is hereafter called virtual zone V.) Moreover, when semantics is clear, a virtual zone is only called zone.. The total number of zones becomes m pieces.
[0036] The zone number (zone number) n is assigned corresponding to each virtual zone V. Zone number n is set to n= 0, 1, 2 and 3, --, i-1, i, --, m, and m-1.
[0037] Drawing 3 shows the configuration of the disk record regenerative apparatus (disk drive) with which the disk play back system by this example was applied.
[0038] The spindle motor 2 of this disk record regenerative apparatus is rotated by perfect CAV. Namely, criteria rotational frequency signal S2 outputted from the criteria rotational frequency signal generator 9 A spindle motor 2 is this criteria rotational frequency signal S2 by one input terminal of that comparator circuit 6 of the servo loop which consists of rotation sensors 4, such as a comparator circuit 6, the drive circuit 8, a spindle motor 2, and a frequency electric organ, and a rotational frequency detector 5 being supplied. Fixed rotation is carried out with the fixed rotational frequency value to express.
[0039] The system controller 50 which functions also as a timing generator on the other hand again as a control means which performs various control of record playback is connected to each internal circuit while connecting with an external host computer.
[0040] The system controller 50 includes the processor for the servo controls (tracking control, focal control, seeking control, etc.) of CPU (central control unit), ROM (read-only memory) into which software is built, RAM for work pieces, a data buffer (while once collecting the data supplied from a host computer, the business which once collects the playback data RD read from the disk 21 is presented), and the optical head 31, the SCSI interface, etc.
[0041] A record playback command etc. is supplied to a system controller 50 from a host computer. A system controller 50 decodes this record playback command, and the sector number SN (a sector number SN shall increase from the truck by the side of the most inner circumference of an optical disk 21 continuously toward the truck by the side of the outermost periphery (0, 1, 2, ...)) set as the object of that record playback is supplied to the zone conversion circuit 28 which is a conversion circuit. The zone conversion circuit 28 supplies zone number n corresponding to the supplied sector number SN to the input terminal of 1 of synthesizer ZAIZA 29 of a PLL synthesizer configuration.
[0042] The total zone several m (the values of m are for example, 147 zones) is supplied to other input terminals of this synthesizer 29 from a system controller 50. In the input terminal of further others of a synthesizer 29, it is the criteria oscillator 30 to the frequency f0. Reference clock CK0 It is supplied.
[0043] From a synthesizer 29, they are these zone number n and total zone severalm and reference clock CK0. It is based and the clock CK of a frequency f is generated, and this clock CK is supplied to the input terminal of 1 of a synchronizer 37 while it is supplied to the input terminal of 1 of a record circuit 33 as a clock for writing.
[0044] The record data WD are supplied to other input terminals of a record circuit 33 through a terminal 22 from a system controller 50. From a record circuit 33, the record signal WS by which the

predetermined modulation of this record data WD was carried out with Clock CK (or that multiplying clock) is supplied to fixed input terminal 32b of 1 of a multiplexer 32.

[0045] It writes in 32d of switch control terminals of a multiplexer 32 from a system controller 50, and gate signal WG is supplied, and when this write-in gate signal WG is high-level, as for a multiplexer 32, common terminal 32a is connected to fixed-end child 32b like illustration. In this condition, data are recorded on data-division D on the disk 21 by which fixed rotation is carried out with the spindle motor 2 (refer to drawing 1) by laser beam L by the record signal WS being supplied to the optical head 31 through a multiplexer 32.

[0046] Although it is common knowledge about the quantity of light control circuit of laser beam L by the system controller 50 to the optical head 31, and it is not illustrating in order to avoid complicatedness, in addition, in the case of record By laser beam L weak in comparison being irradiated by the disk 21 in header H ID information containing the address information from Header H will be read, the reinforcement of laser beam L will be switched in the offset section OF, and laser beam L strong in comparison will be irradiated by data-division D in data-division D.

[0047] And in the case of the playback from a disk 21, laser beam L weak in comparison is irradiated by all the sectors P. ID information which contains address information from header H by this laser beam L is read. At this time, write-in gate signal WG has a low level, and that regenerative signal RF is supplied to the input terminal of 1 of a synchronizer 37 through common terminal 32a of the optical head 31 and a multiplexer 32, and fixed-end child 32c.

[0048] The lead gate RG is supplied to the gate input terminal of a synchronizer 37 through a terminal 34 from a system controller 50. The clock which synchronized with the VFO signal included in a regenerative signal RF is generated by this synchronizer 37, the playback data RD are read from a regenerative signal RF with that clock that synchronized, and the lead gate RG high-level to this synchronizer 50 is supplied to a system controller 50 through a terminal 35, when supplied.

[0049] In this case, when the lead gate RG is a low level, Clock CK is supplied to a synchronizer 37 from a synthesizer 29. The synchronizer 37 is operating so that the multiplying clock which synchronized with the frequency f of this clock CK may be generated inside. When the regenerative signal RF is not supplied to a synchronizer 37, thus, making it operate with Clock CK In order to shorten drawing-in time amount to the frequency of this VFO signal when a regenerative signal RF is supplied since the frequency of the VFO signal included in a regenerative signal RF is almost the same as the frequency f of this clock CK It is for making PLL (not shown) which constitutes a synchronizer 37 draw in the frequency f of Clock CK beforehand.

[0050] Next, important section actuation of the example of drawing 3 is explained.

[0051] If a sector number SN is supplied to a zone conversion circuit from a system controller 50, the number (zone number) n of the zone where the sector number SN exists will be outputted from the zone conversion circuit 28. The zone conversion circuit 28 is good also as a look-up table. In addition, a sector number SN and zone number n correspond to a meaning.

[0052] A synthesizer 29 is (1) of reference frequency f0, zone number n, and total zone severalm to a degree. The clock CK of a frequency fi with which an object sector exists according to a formula is generated, and a record circuit 33 and synthesizer clo NAIZA 37 are supplied.

[0053]

[Equation 1]

fi= {1+ (n/m)}, f0 -- (1) [0054] Reference frequency f0 It is equal to the frequency f of the clock CK in a zone number n= 0 (virtual zone V= 1). A frequency [in / when the total zone several m is set about to m= 128 / virtual zone V=m] is highest frequency fmax=(1+127/128) f0. It becomes and it turns out that the change width of face of the frequency of the data transfer clock CK does not double [about] at the maximum in this case.

[0055] Thus, if it sets in principle with the generated clock CK in the virtual zone V corresponding to the zone number n=i (V=i +1), and read/write-operates and puts in another way to a disk 21 with the same frequency fi, record playback actuation will be performed.

[0056] Drawing 2 B is a formula (1). The value-change property of the frequency f of the clock CK

which is based and is set up to the virtual zone V of an optical disk 21 (generated by the synthesizer 29) is shown. In the virtual zone V same as a principle, it turns out that data transfer clock frequency f is regularity (for example, virtual zone V=i +1 f=fi).
[0057] It is a formula (2), using omega radius as r for the angular frequency of rotation of a disk 21, in order to attain the format (track recording density fixed format) by CLV on a disk 21. It becomes conditions that equality is satisfied.
[0058]
[Equation 2] (r omega/f) = regularity -- (2) [0059] The radius location by the side of the most inner circumference of each zone V is considered. They are radius r=rn and clock frequency f about a radius here f=fn When it carries out, these radii r and clock frequency f are a formula (3), respectively. Formula (4) It is given.
[0060]
[Equation 3] rn =(1+n/m) r0 -- (3) [0061]
[Equation 4] fn =(1+n/m) f0 -- (4) [0062] formula (3) And formula (4) from -- omegan =omega0 It is obtained. That is, all the rotational frequencies by the side of the most inner circumference of each zone V turn into the same rotational frequency.
[0063] And in each zone V, it is thought that it is necessary to decrease a rotational frequency as a radius r increases. Fluctuation of this number of zone internal version differs in each zone V, and is formulas (5). It is given.
[0064]
[Equation 5] (n+m)/(n+m +1) -- (5) [0065] formula (5) from -- if it puts in another way so that the value of zone number n is small when the total zone several m is given, the inner circumference side of a disk 21 is understood that the amount of fluctuation of a rotational frequency is large. Moreover, if the total zone several m is increased, there will be few amounts of fluctuation of a rotational frequency, and they will end.
[0066] For example, amount omega/omega 0 of fluctuation in the virtual zone V= 1 of the zone number 0 if a zone several m [total] value is set to m= 128 and zone number n is set to n= 0 of the most inner circumference Since it is set to omega/omega 0 =(0+128)/(0+128+1) =0.9922, it becomes fluctuation of about 0.78% of rotational frequency (refer to drawing 2 C). If this divides the total number m of zones of the virtual zone V (partition) about into m= 128, it turns out that it is settled to 1% or less even in the large place of fluctuation by the inner circumference side of a disk 1.
[0067] That is, since it is the amount of fluctuation of this amount, if the deflection from a CLV format can be absorbed without changing the rotational frequency of a spindle motor 2, the view which becomes the point of this invention of it becoming unnecessary to perform control by CLV in a zone will be conceived.
[0068] In order to perform this concretely (i.e., in order to absorb deflection), as shown in drawing 1 It is sector length SL (you may consider the die length of data-division D.) about the die length of the buffer section BF which is the sector gap which exists between Sector P and the ****** sector P+1. If it sets to value about extent exceeding 1%, for example, 1.5%, fluctuation (deflection) of the die length of data-division D by the bias of the clock CK at the time of record is absorbable. In addition, since there is usually the drawing-in range of several % of PLL which constitutes the synchronizer 37 at the time of playback, especially a problem is not generated.
[0069] So, in the example of drawing 3 , if an object sector is specified by the record playback command, a virtual zone number will be specified with the track number in which the object sector exists, and the clock CK which has the frequency f determined by the formula (1) will be determined by the synthesizer 29 from zone several m and zone number n which are given beforehand.
[0070] Record and regeneration of only the number of sectors specified with this determined clock CK are performed by the basis of disk fixed rotation, i.e., CAV. The zone V on a disk 1 is virtual, and is not the division to which any distinction exists on a disk 1.
[0071] Therefore, if it puts in another way during record playback with the same command, without performing any new processings even if the optical head 31 crosses the virtual zone V (even when it

moving from the zone of 1 to the next zone), it is possible to continue record playback in the next zone concerned with the clock CK of the same frequency. However, since record playback is performed in this case using the record playback clock CK which has a frequency in a front zone, the bias from a CLV format becomes large.

[0072] Then, it is possible to restrict the number of sectors (write-in merit or read-out length) which performs record playback by the same command as this cure. And restricting the number of the sectors which write in from verification actuation surely being performed in the case of record by that a command is published every 64kB(s) with the equipment as which UNIX was usually adopted as an OS, and WO disk, and actuation write-in [more than the capacity of the data buffer in a system controller 50] not being performed at once etc., and are sometimes performed by the same command does not spoil the system-wide engine performance. On the other hand, at the time of read-out, since what is necessary is to perform an internal retry and just to redouble with the clock of a predetermined zone, when the lock of PLL which constitutes a synchronizer 37 separates, it is satisfactory.

[0073] Thus, the disk 21 formatted by CLV is faced carrying out record playback to each zone V which classified into the virtual zone V according to the location on a radius r, and was classified, a disk 21 is rotated by CAV, and, according to the above-mentioned example, a different record playback clock CK with which a frequency becomes high stair-like toward an outside is using from the inside radial [R] for each zone V of every. Although the die length of data-division D becomes long by the periphery side as compared with the inner circumference side in each zone V when it does in this way, the disk 21 formatted by CLV can be used by forming the part buffer section BF which becomes long [this die length], making it able to rotate by CAV.

[0074] In addition, what is necessary is just to determine the value of the number of partitions m of the virtual zone V in consideration of the rate of die length to a synthesizer 29, the multiplying possible number of a synchronizer 37, the engine speed of the drawing-in range and a disk 21, and data-division D of the buffer section BF etc. Of course, the rate of die length to data-division D of the buffer section BF may be determined so that a monograph affair may be satisfied. Thereby, the rapid access nature by the large storage capacity by CLV and CAV can be formed in coincidence.

[0075] Moreover, what is necessary is just to make a synthesizer 29 and a synchronizer 37 a duplex-ized configuration, in order to avoid increase of the bias (change of the record die length of data-division D) by using it without switching the predetermined clock CK with which frequencies differ to having crossed the limit of this write-in merit and the virtual zone. Also at the time of read-out, it can respond by this synthesizer 29 and synchronizer 37 that were duplex-ized.

[0076] Drawing 4 shows the configuration of the important section of the optical disk drive which adopted Synthesizers 29 and 29A and Synchronizers 37 and 37A which were duplex-ized. In addition, in drawing 4 , the same sign is attached to the thing corresponding to what was shown in drawing 3 , and the detailed explanation is omitted.

[0077] In this example of drawing 4 , although the point that a sector number SN is supplied to the zone conversion circuit 28 through a terminal 54 from a system controller 50 is the same as drawing 3 , a sector number SN is supplied also to the change-over signal creation machine 57. The change-over signal creation machine 57 specifies the change-over sector (change-over truck) of the virtual zone V from a sector number SN, and supplies it to the control terminal of the multiplexer 53 which switches the control terminal and Synchronizers 37 and 37A of a multiplexer 52 which switch Synthesizers 29 and 29A for a switch signal, respectively.

[0078] Namely, clock CK 1 which has frequency fi-1 of virtual zone V=i of zone number n=i -1 which started record playback in the condition that common terminal 52a of a multiplexer 52 and fixed-end child 52b were connected, and common terminal 53a of a multiplexer 53 and fixed-end child 53b were connected One synthesizer 29 and synchronizer 37 synchronize and perform above-mentioned record playback actuation. Clock CK 2 which has the frequency fi of virtual zone V=i +1 of adjoining zone number n=i which is, on the other hand, going to use waiting synthesizer 29A and synchronizer 37A for a degree It is made to synchronize beforehand. When the optical head 31 crosses from virtual zone V=i to virtual zone V=i +1, it switches to waiting these synthesizer 29A and synchronizer 37A promptly

(common terminal 52a of a multiplexer 52 is switched to the fixed-end child 52c side). common terminal 53a of a multiplexer 53 is switched to the fixed-end child 53b side. there is no time delay -- as -- the clock used -- clock CK 1 from -- clock CK 2 It is made to change. Then, the synthesizer 29 and synchronizer 37 which newly became waiting are the clock CK 1 used of virtual zone V=i +2 of following zone number n=i +1. What is necessary is just to make it synchronize.
[0079] In addition, it is also possible to switch a clock for every zone in the dummy sector part, without taking the configuration of such duplex-izing, if not using 1 sector of a break as a dummy sector etc. prepares the break of a certain zone on a disk 21 without having a view of dividing into the virtual zone V.
[0080] In the example mentioned above, although the optical disk of a postscript mold was explained as an example as a disk 21, the same control system is applicable also to CD and CD-ROM which are recorded in the CLV format. Moreover, it is employable also as a rewritable MO disk. Moreover, it is not necessarily restricted to an optical disk and can apply to magnetic disks, such as a hard disk, etc.
[0081] In addition, as for this invention, it is needless to say that various configurations can be taken, without deviating not only from the above-mentioned example but from the summary of this invention.
[0082]
[Effect of the Invention] As explained above, according to this 1st invention, the disk formatted by CLV is classified into a virtual zone according to a radius location. Face carrying out record playback to each classified zone, rotate a disk by the CAV (rotational frequency regularity) method, and from the radial inside for every zone by using a different record playback clock with which a frequency becomes high stair-like toward an outside It enables it to use the disk formatted by CLV, making it rotate by CAV (rotational frequency regularity). For this reason, large capacity nature and rapid access nature can be attained to coincidence.
[0083] In addition, since the engine speed of a disk is fixed, when the optical disk drive with which this invention was applied, for example, has two or more heads to both sides of a disk, the derivative effectiveness that it becomes possible to make seek operation and record playback actuation perform independently is also acquired, without depending for those heads mutually.

[Translation done.]

* NOTICES *

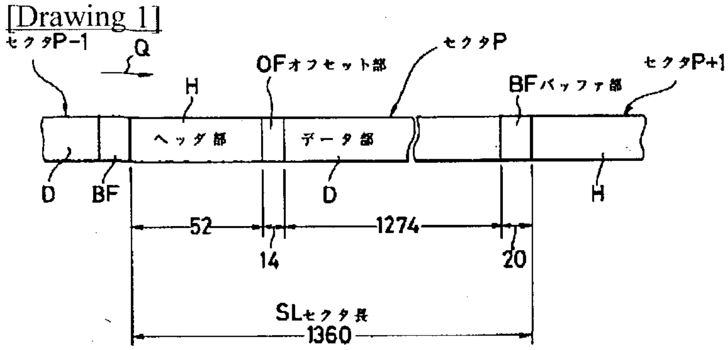
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the diagram with which explanation of sector format is presented.
[Drawing 2] A is a diagram showing the condition that this invention method divided the optical disk into the virtual zone. B is the diagram showing the change property of the frequency of a clock. C is a diagram with which explanation of rotational frequency fluctuation is presented.
[Drawing 3] It is the diagram showing the configuration of the example of a disk record regenerative apparatus to which one example of this invention method was applied.
[Drawing 4] It is the diagram showing the configuration of the example of a disk record regenerative apparatus to which other examples of this invention method were applied.
[Drawing 5] It is the diagram showing the configuration of the general roll control system of a disk.
[Drawing 6] A is a diagram with which explanation of a record format of CAV is presented. B is a diagram with which explanation of a record format of CLV is presented. C is a diagram with which explanation of a record format of a MCAV method is presented.
[Drawing 7] It is the diagram with which explanation of the storage capacity by the record format of an all directions type shown in drawing 6 is presented.
[Drawing 8] It is the mimetic diagram showing the flat-surface configuration of the optical disk divided into the virtual zone.
[Description of Notations]
21 Optical Disk
28 Zone Conversion Circuit
29 Synthesizer
31 Optical Head
33 Record Circuit
37 Synchronizer
CK Clock
n Zone number
m The total number of zones

[Translation done.]

DRAWINGS

[Drawing 1]



セクタフォーマット

[Drawing 2]

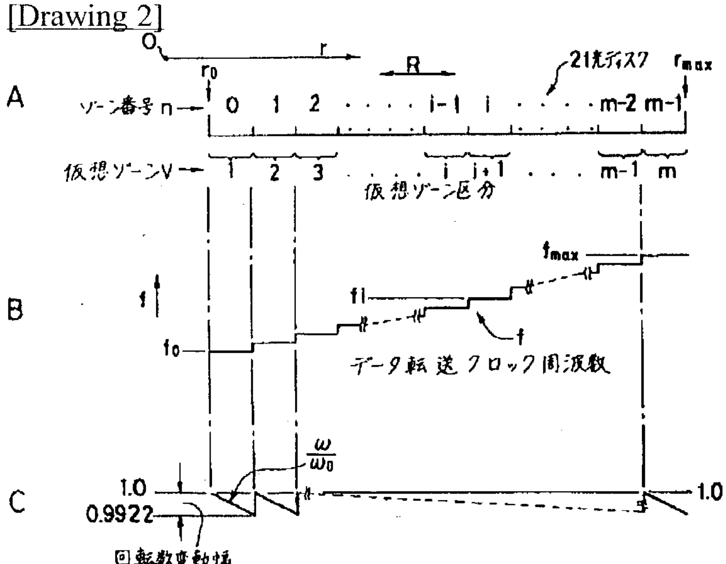
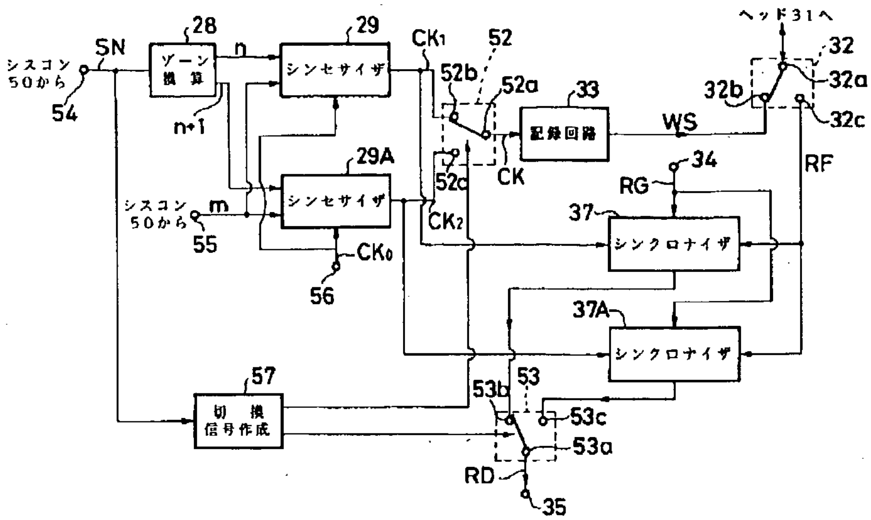


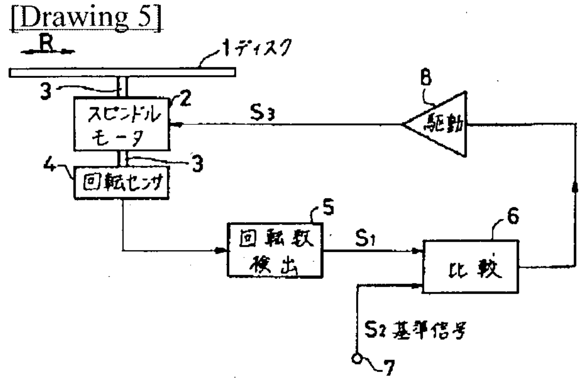
図2 例の動作

[Drawing 4]



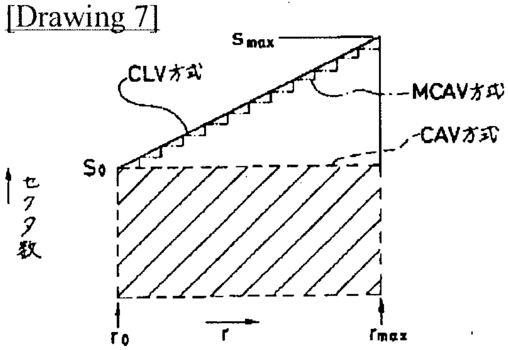
他の実施例

[Drawing 5]



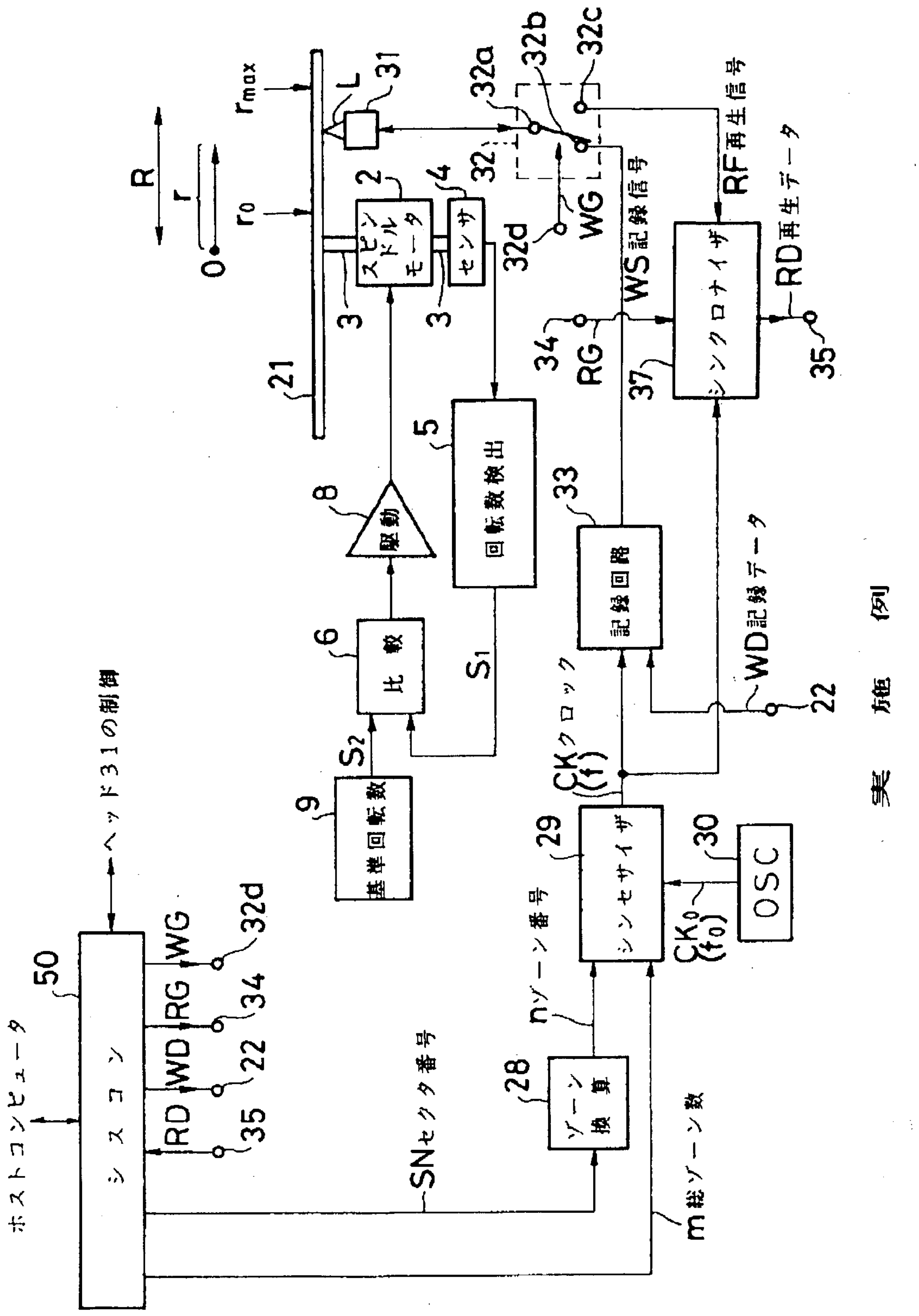
ディスクに対する一般的な回転制御系

[Drawing 7]



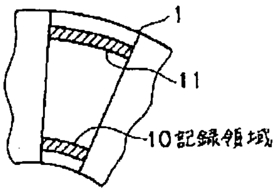
各方式の記憶容量

[Drawing 3]

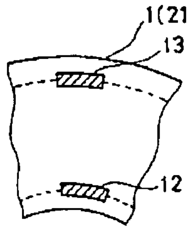

実施例
ホストコンピュータ
システム
ヘッド31の制御
基準回転数
比較
駆動
回転数検出
スピンドルモータ
センサ
記録回路
シンクロナイザ
シンセサイザ
ゾーン換算
OSC
SNセクタ番号
nゾーン番号
m総ゾーン数
CKクロック (f)
CK_0 (f_0)
WD記録データ
WS記録信号
RF再生信号
RD再生データ
RD
WD
RG
WG
S_1
S_2
R
r
r_0
r_{max}
0
L

[Drawing 6]

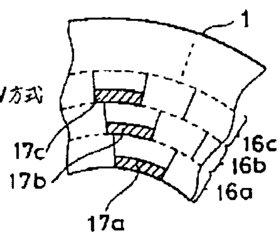
A CAV方式



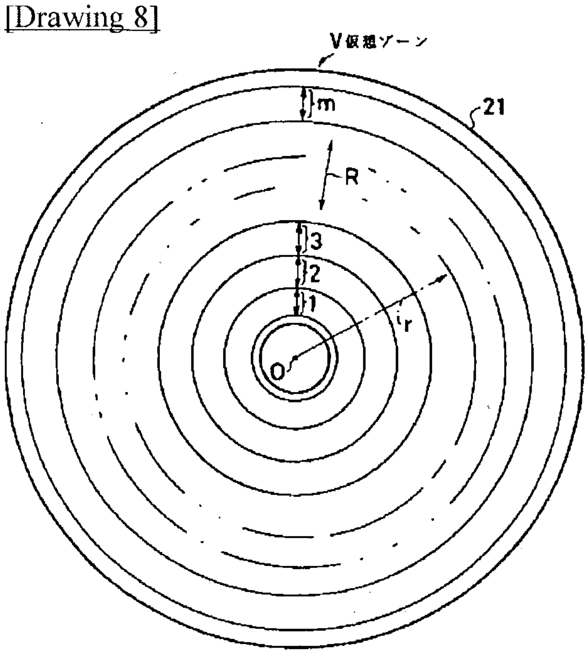
B CLV方式



C MCAV方式



[Drawing 8]



仮想ゾーンの区分

[Translation done.]